

What is Claimed:

1 1. A method of charging a battery having an internal
2 resistance and an external resistance connected to the battery comprising the
3 steps of:

4 applying electrical energy to the battery; and

5 adjusting, at each of a plurality of predetermined intervals, the
6 electrical energy applied to the battery based on at least one of the internal
7 resistance of the battery and the external resistance connected to the
8 battery.

1 2. The method of claim 1 comprising the additional step of:

2 determining at least one of (a) the internal resistance of the
3 battery, and (b) the external resistance connected to the battery.

1 3. The method of claim 1 comprising the additional step of:

2 determining a voltage drop associated with at least one of (a)
3 the internal resistance of the battery, and (b) the external resistance
4 connected to the battery.

1 4. The method of claim 3 wherein the determining step
2 occurs when the battery is substantially neither charging nor discharging.

1 5. The method of claim 3 comprising the additional steps of:

2 (a) applying the electrical energy to the battery for a
3 predetermined charging time period;

4 (b) applying a discharge pulse to the battery for a
5 predetermined discharging time period;

6 (c) providing a predetermined rest period during which neither
7 the electrical energy nor the discharge pulse is applied to the battery, and
8 during which the determining step takes place; and

9 (d) repeating steps (a), (b), and (c).

1 6. The method of claim 3 wherein a protective device is
2 connected to the battery and the determining step includes determining a
3 voltage drop across the protective device.

1 7. The method of claim 3 wherein the battery is comprised of
2 at least one of a terminal resistance and a lead resistance and the
3 determining step includes determining a voltage drop across at least one of
4 the terminal resistance and the lead resistance.

1 8. The method of claim 1 having a charging period and a
2 non-charging period comprising the additional steps of:

3 (a) measuring the voltage of the battery during the non-
4 charging period; and

5 (b) measuring the voltage of the battery during the charging
6 period,

7 the electrical energy being adjusted during the adjusting step
8 based on a difference between the voltage measured during step (a) and the
9 voltage measured during step (b).

1 9. The method of claim 1 having a charging period and a
2 non-charging period comprising the additional steps of:

3 (a) determining if the battery voltage during the non-charging
4 period is greater than or equal to a predetermined threshold voltage level;
5 and

6 (b) terminating a constant current portion of a charging cycle if
7 the battery voltage during the non-charging period is greater than or equal to
8 the threshold voltage level.

1 10. The method of claim 1 comprising the additional steps of:

2 (a) determining if a charging current being applied to the battery
3 is greater than a predetermined current level during a constant current phase
4 of a charging cycle of the battery;

5 (b) decreasing the charging current if it is determined to be
6 above the predetermined current level; and

7 (c) increasing the charging current if it is determined to be below
8 the predetermined current level.

1 11. The method of claim 1 comprising the additional steps of:

2 (a) determining if a charging current being applied to the battery
3 is below a predetermined current level during a constant voltage phase of a
4 charging cycle of the battery; and

5 (b) terminating the constant voltage phase of the charging cycle
6 if the charging current being applied to the battery is below the
7 predetermined current level.

1 12. The method of claim 1 wherein the adjusting step includes
2 adjusting the duration of a pulse of the electrical energy applied to the
3 battery.

1 13. A computer readable carrier including computer program
2 instructions for implementing a method of charging a battery having an
3 internal resistance and an external resistance connected to the battery, the
4 method comprising the steps of:

5 applying electrical energy to the battery; and

6 adjusting, at each of a plurality of predetermined intervals, the
7 electrical energy applied to the battery based on at least one of the internal
8 resistance of the battery and the external resistance connected to the
9 battery.

1 14. The computer reader carrier of claim 13 wherein the
2 method comprises the additional step of determining a voltage drop
3 associated with at least one of (a) the internal resistance of the battery, and
4 (b) the external resistance connected to the battery.

1 15. The computer reader carrier of claim 14 wherein the
2 method comprises the additional steps of:

3 (a) applying the electrical energy to the battery for a
4 predetermined charging time period;

5 (b) applying a discharge pulse to the battery for a
6 predetermined discharging time period;

7 (c) providing a predetermined rest period during which neither
8 the electrical energy nor the discharge pulse is applied to the battery, and
9 during which the determining step takes place; and

10 (d) repeating steps (a), (b), and (c).

1 16. The computer reader carrier of claim 13 wherein the
2 method comprises the additional steps of:

3 (a) measuring the voltage of the battery during a non-charging
4 period; and

5 (b) measuring the voltage of the battery during a charging
6 period,

7 the electrical energy being adjusted during the adjusting step
8 based on a difference between the voltage measured during step (a) and the
9 voltage measured during step (b).

1 17. An electronic device comprising:

2 a battery having an internal resistance and an external
3 resistance connected to the battery; and

4 a computer readable carrier including computer program
5 instructions for implementing a method of charging the battery, the method
6 comprising the steps of:

7 applying electrical energy to the battery; and

8 adjusting, at each of a plurality of predetermined intervals, the
9 electrical energy applied to the battery based on at least one of the internal
10 resistance of the battery and the external resistance connected to the
11 battery.

1 18. The electronic device of claim 17 wherein the method
2 comprises the additional step of determining a voltage drop associated with
3 at least one of (a) the internal resistance of the battery, and (b) the external
4 resistance connected to the battery.

1 19. The electronic device of claim 18 wherein the method
2 comprises the additional steps of:

3 (a) applying the electrical energy to the battery for a
4 predetermined charging time period;

5 (b) applying a discharge pulse to the battery for a
6 predetermined discharging time period;

7 (c) providing a predetermined rest period during which neither
8 the electrical energy nor the discharge pulse is applied to the battery, and
9 during which the determining step takes place; and

10 (d) repeating steps (a), (b), and (c).

1 20. The electronic device of claim 17 wherein the method
2 comprises the additional steps of:

3 (a) measuring the voltage of the battery during a non-charging
4 period; and

5 (b) measuring the voltage of the battery during a charging
6 period,

7 the electrical energy being adjusted during the adjusting step
8 based on a difference between the voltage measured during step (a) and the
9 voltage measured during step (b).

1 21. An electronic device comprising:

2 a battery having an internal resistance and an external
3 resistance connected to the battery; and

4 a processor, the processor controlling an electrical energy source
5 for applying electrical energy to the battery, and

6 the processor adjusting, after each of a plurality of
7 predetermined intervals, the electrical energy applied to the battery based on
8 at least one of the internal resistance of the battery and the external
9 resistance connected to the battery.

1 22. The electronic device of claim 21 wherein the method
2 comprises the additional step of determining a voltage drop associated with

3 at least one of (a) the internal resistance of the battery, and (b) the external
4 resistance connected to the battery.

1 23. The electronic device of claim 22 wherein the method
2 comprises the additional steps of:

3 (a) applying the electrical energy to the battery for a
4 predetermined charging time period;

5 (b) applying a discharge pulse to the battery for a
6 predetermined discharging time period;

7 (c) providing a predetermined rest period during which neither
8 the electrical energy nor the discharge pulse is applied to the battery, and
9 during which the determining step takes place; and

10 (d) repeating steps (a), (b), and (c).

1 24. The electronic device of claim 21 wherein the method
2 comprises the additional steps of:

3 (a) measuring the voltage of the battery during a non-charging
4 period; and

5 (b) measuring the voltage of the battery during a charging
6 period,

7 the electrical energy being adjusted during the adjusting step
8 based on a difference between the voltage measured during step (a) and the
9 voltage measured during step (b).